

**Water Audit for  
Jordan Radio & Television Station  
February 2001.**

**Prepared by:**

**Water Efficiency and Public Information for Action  
(WEPIA)**

**Submitted to:**

**MWI  
Amman - Jordan**

**Submitted by:**

**The Academy for Educational Development  
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## **JORDAN RADIO AND TELEVISION STATION**

### **A. OVERVIEW**

Television transmission in Jordan started in April 1968 with four hours of programming in black and white. The following years saw two milestones for JTV. In 1972 it became the first station in the region to operate a second channel and in 1974 Jordan TV started transmitting in full color using the PAL-B system. Today JTV broadcasts to a large geographical area that includes the following countries--PNA (Palestinian National Authority), Syria, Northern Saudi Arabia, Israel and South Lebanon. In 2001 JTV reduced its channels to a single channel in order to improve its efficiency and improve the quality of programming. As part of its efficiency efforts, cost and self-sufficiency became a major factor.

#### **Radio Jordan**

Since transmission began from Amman in March of 1956 Radio Jordan has developed into a modern service reaching globally. Radio Jordan's Arabic service is one of the few stations that are on the air 24 hours a day. Its programs include news, sports, documentaries, and drama as well as community services in addition to modern and classical Arab music.

Jordan Radio and TV headquarters are located in Amman in Al-Quasmeh area. It encompasses a large area that includes the television station and the radio station and substantial grounds under landscaping. The two stations between them have over 2000 employees in addition to around 450 guards, this despite major layoffs in recent months to reduce the size of its workforce and restore some measure of cost efficiency. The landscaped area is so large that it alone consumes approximately 40% of the total water consumption of the agency.

The Radio and Television station consumes a vast quantity of potable water each year. Its consumption levels are unsustainable in a country such as Jordan which has endemic water shortages as well as seriously affecting its annual budget. The director of JTV, Mr. Nart Bouran asked WEPIA to audit the facilities and provide recommendations and advice on how JTV can conserve water. Dr. Mustafa Hamarneh, a member of the Board of JTV, was the principal liaison between the TV and WEPIA.

## **b. OBJECTIVES**

- Identify key points of consumption in the facilities and recommend ways to reduce consumption.
- Check sanitary fixtures (faucets, toilets and showerhead) for flow rates, flush rates and leaks and make appropriate recommendations.
- Identify suitable water saving devices to be installed, estimate costs and pay back period.
- Evaluate the landscaped area and make recommendations for reductions in water use.
- Estimate the cost-savings to be gained from following the WEPIA recommendations.

### **Audit Team**

A team was assembled by WEPIA of individuals who had trained by WEPIA and was provided as a free service to JTV. No team member was paid, and the service was considered to be a part of their practicum.

The auditors were:

Eng. Raed Nimri	AED / WEPIA—Team Leader
Eng. Motasem Haddaden	AED / WEPIA
Razan Shahen	Environmental Consultant Office
Mansour Ramadan	Al- Rawnak stores
Orsan Al-Dal'a	Irshaidat Co. for Tra. And Cont.

### **General Findings**

- The combined consumption of the TV and radio station and their auxiliary buildings, is approximately 15500 m<sup>3</sup> yearly. 68% of that water is provided by the municipality (LEMA), while the remaining 32% comes from private water reservoirs on the premises filled by tankers.
- The municipality water charge for commercial, non-residential buildings is 1.5 JD for each cubic meter while the water tanker charges vary, but average around 0.5 JD per cubic meter. JTV uses their own private tank. Thus the total annual cost of water for JTV is 21266 JDs.
- JTV has three underground storage wells of 120, 80 and 36 m<sup>3</sup> capacity from which they pump water to the water storage tanks on the top of their buildings.
- Bathrooms in the buildings are mostly in poor condition except for those in the new building in the radio station and TV station. More than 90% of the toilets are Turkish, and are no longer connected to the roof tanks. Instead a water bucket of approximately 1.5 liters volume is used. This method actually does not consume much water, even though it is a very traditional method.
- Most faucets in the facility are no better than the toilets. Most of the faucets are single taps and un-threaded. The flow rate in these taps is quite high, and

the pressure is also relatively high. The WEPIA team measured flow rates and pressure on the ground floor in the older building of JTV housing the radio station, at 1.5 Bar which is relatively high considering that they don't use any pressurized system. The buildings function with gravity flow. It appears that the high pressure is primarily due to the large diameter of the water pipes, which are 1.5 Inches. The flow rate varied from 9 liters per minute to 28 liters per minute.

- The facilities do house a few showers but these are rarely used.
- There is no irrigation system. Plants are manually watered with a hose of 3/4 inch diameter, which is considered relatively large. Due to poor soil conditions and bad watering the soil has become cracked so that plants do not benefit from surface watering. A separate report on the landscaping is attached to this report.
- The facilities own their own garage just outside the grounds and it is directly connected to the JTV water supply. An average of 20 cars are washed every day, from limousines to vans and trucks. The wastewater from the car wash drains directly to the sewers and there are no facilities for water reuse or recycling- unlike other car wash businesses.
- The maintenance people at JTV are exceptional and sensitive to the need to save water. They state they have tried many methods to save water but without success.
- There is severe wear and tear on the sanitary fixtures from consumers and quite a bit of vandalism. At one site the trim of western toilets were changed every month. Each time users damaged them, until finally the maintenance staff disconnected the cistern from the water supply and replaced it with a water bucket instead.

The number of visitors to a TV/radio station is small and so the number of individuals using the system remains fairly constant. **In that case, one of the best recommendations for water conservation is to initiate an employee awareness program.**

### c. FINDINGS ON SANITARY FIXTURES

#### Faucets

***Table 1. Sinks/Faucets***

*Radio station*

Type	Location	Total	No. Leaking	Flow Rate L/min	Notes
	<b>Old Bu.</b>	----			
Manual	Staff	6	0	25	1 <sup>st</sup> floor – T **
Manual	Staff	2	0	15	2 <sup>nd</sup> floor - T **
Manual	Staff	2	0	15	3 <sup>rd</sup> floor – T **
	<b>New Bu.</b>	----	0		
Manual	Staff	10	0	15	1 <sup>st</sup> floor – T **
Manual	Staff	11	0	12	2 <sup>nd</sup> floor – T **
	<b>Other Bu.</b>				
Manual	Storage	2	0	10	N*
Manual	Sleeping R.	6	0	12	N*
Infrared	Guards	6	0	10	N*
Manual	Training	7	0	8.6	T**
Manual	Other	7	0	10	N*
Manual	Mosque	8	0	20	T**
Manual	<b>Guard Camp</b>	<b>65</b>	<b>0</b>	<b>10.5</b>	<b>51 N*, 14 T**</b>
Manual	Purchase Dept.	12	0	10.7	6 N*, 6 T **
Manual	Central prod.	4	0	14.3	3 N*, 1 T **
Manual	Manager Branch	9	0	12	4 N*, 5 T **
	Manual	TV programs 1 <sup>st</sup> floor	4	0	20
	Manual	TV programs 2 <sup>nd</sup> floor	5	0	9
	Manual	TV programs 3 <sup>rd</sup> floor	4	0	9
	Manual	TV programs 4 <sup>th</sup> floor	5	0	6
	Manual	TV guards	2	0	14
	Manual	Painting workshop	2	0	20
	Manual	Amra station	2	0	14
	Manual	Decoration Build.	1	0	6
	Manual	Maintenance Build.	2	0	20
	Manual	Bank	2	0	6
<b>Total 195</b>					

T\*\*: threaded. N\*: Non-threaded.

#### Car wash

20 car / day wastewater is sent directly to the sewage system without reuse.

**The total number of Faucets in both stations is 195 with a weighted average flow rate of 11.94 liters/minute.**

### **Toilets**

***Table 2. Toilets***

Type	Tank Handle	Location	Total W.C.	No. Leaking	Tank Capacity Liters	Notes
Turkish	----	Radio-old	31	0	1.5	Using a Bucket
Gravity	Side	Radio-old	15	0	12	---
Turkish		Radio-new	22	0	1.5	Using a Bucket
Gravity	Side	Radio-new	2	0	12	---
Turkish		TV-station	34	0	1.5	Using a Bucket
Gravity	Upper	TV-station	57	2	9	---
Turkish		Guards	13	0	1.5	Using a Bucket
<b>Total Turkish Toilets</b>		<b>100</b>	<b>Total western toilets</b>		<b>74</b>	

***Table 3. Showers***

Location	Users	Total	No. Leaking	Flow Rate l/min	Notes
Radio-Old	Staff	6	0	20	
Radio-new	Staff	3	0	20	
TV-station	Staff	16	0	20	
Guards	Staff	21	0	9	
<b>Total Showers</b>		<b>46</b>			

***Table 4. Urinals***

Location	Users	Total	No. Leaking	Notes
Radio-Old	Staff	12	0	Hand control
Radio-new	Staff	16	2	Automatic – 3L
TV-station	Staff	15	0	Hand control
Guards	Staff	0	0	

**Total Number of Urinals is 43**

## **d. ESTIMATES OF WATER SAVINGS AND COST-EFFECTIVENESS**

### **Introduction**

In order to calculate the water savings achieved by installing water saving devices the following assumptions need to be made.

*The Number of employees and visitors:*

There are 2000 employees in the TV and Radio station in addition to 450 guards that have a residence/dormitory within the grounds. The number of visitors is so small that they are not included in this calculation.

In order to make appropriate calculations, staff is divided into those who spend 24 hours on the grounds such as the guards, and regular employees who average 8 hours day on site. Naturally guard usage of water fixtures is going to be greater than that of the daily employees.

**Assumptions**

In order to calculate water savings with any degree of accuracy two sets of assumptions about water use and water behavior are taken into account. One is general assumption about use, which is standard, and the other uses data provided by employees on site during interviews.

**Assumptions for using water fixtures.**

- Each person uses the bathroom twice a day.
- Regular employees work a six-day week
- Each person uses a faucet 3 times a day for half a minute each time.
- Each shower is used only once a day for 10 minutes (these are rarely used except by night staff)
- Faucets are assumed to be 70% opened for those which have more than 15 L/Min flow rate, and 80 % for faucets which have a flow rate more than 6 and less than 15 liters per minute.
- For the guards, different set of assumptions apply because they stay 24 hours, seven days a week, and their water use for fixtures is going to be greater
- Faucet use 4 times a day 0.5 minutes each.



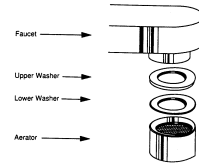
## Savings to be Obtained from Retrofitting Faucets

**“ For all of Jordan WEPIA recommends a maximum faucet flow rate of 6 liters per minute “**

**a. JTV and Jordan Radio combined estimates:**

**130** faucets with an existing average flow rate of **12.66** liters per minute.

Assume a volume of **70 %** of the actual flow rate = **8.86** l/min



**Savings per Year (m<sup>3</sup>) is calculated using the following equation =**  
*No. of uses per day x minutes faucet is open x the number of working days in a year x number of users x difference in flow rate /1000*

$$= 3 \times 0.5 \times 288 \times 2000 \times (8.86 - 6.00) / 1000$$
$$= 2471 \text{ m}^3 \text{ per Year.}$$

**b. Estimates for the Guard residence halls.**

**65** faucets with an average flow rate of **10.5** liters per minute.

Assume a volume of **80 %** of the actual flow rate **8.4** L/ min

**Savings per Year (m<sup>3</sup>) =** *No. Of Uses per day x Minutes faucet is open x the number of working days in a year x Number of users x difference in flow rates /1000*

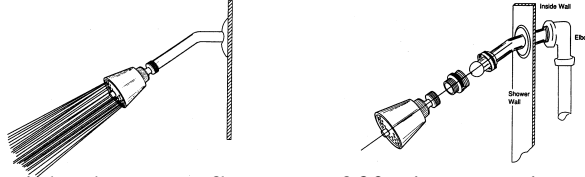
$$= 4 \times 0.5 \times 365 \times 450 \times (8.4 - 6) / 1000$$
$$= 788.4 \text{ m}^3 \text{ per Year.}$$

**Total Saving from installing water saving devices in faucets per Year is 3259.4m<sup>3</sup>**

## Saving in Showers

**“ WEPIA recommends 9 Liter per minute flow rate for showers “**

**a. In both stations**



**25** showers with a weighted average flow rate of **20** Liter per minute.  
Assuming that each shower is used once a day for 10 minutes.

**Saving in showers** = *Number of uses per day x Number of showers x Difference in flow rates x minutes of use each time x 365 / 1000*

$$\begin{aligned} &= 1 \times 25 \times (20 - 9) \times 10 \times 365 / 1000 \\ &= 1003.75 \text{ m}^3 \text{ per Year.} \end{aligned}$$

**b. In guard campus.**

21 showers, with an average flow rate of 9 Liter per minute , and since we recommended a 9 Liter per minute shower then no saving can be achieved.

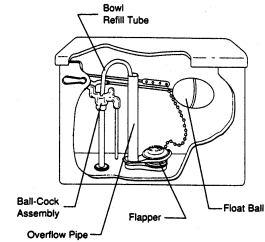
**Total Saving in Showers per Year is 1003.75 m<sup>3</sup>**

## Saving in Toilets

**“ WEPIA recommends 6 Liter tank volume for toilets “**

100 Turkish toilets, in which more that 85% of the staff are using, and 74 western toilets, the western toilets are located in manager’s area and most of them are private toilets.

Assuming that each western toilet is flushed 3 times a day as a minimum.



### **a. In both stations**

74 western toilets with a weighted average tank volume of 9.7 Liters.

$$\begin{aligned}\text{Saving per Year} &= \text{Number of flushes per day} \times \text{Difference in volume} \times 288 / 1000 \\ &= 4 \times (9.7 - 6) \times 288 / 1000 \\ &= 4.26 \text{ m}^3 \text{ per Year.}\end{aligned}$$

There are no savings to be obtained from Turkish toilets. Almost all toilet cisterns have been disconnected from the main water supply and buckets have been supplied to replace them. This itself is a conservative use of water. No recommendations will therefore be made for Turkish toilets.

**Total Saving from Toilets per Year is 4.26 m<sup>3</sup>**

## Saving in Urinals and Bidet

43 urinals and 12 bidets currently exist in the buildings. Most of the urinals are manually controlled. The rest are automated and flush at 3 liters every 15 minutes. WEPIA recommends a 4-liter per flush urinal. Consequently there are no savings to be achieved from installing WSD on these items.

**TOTAL WATER SAVING PER YEAR THAT CAN BE ACHIVED  
FRON INSTALLING WATER SAVING DEVICES “WSD” IS  
4267.41 M<sup>3</sup>**

Since approximately 68% of total water consumption in all buildings comes from municipal water at 1.5 JD /m<sup>3</sup> and 32% comes from tankers at a rate of 0.5 JD / m<sup>3</sup> then the cost savings for using WSDs is as follows:

$$\begin{aligned} \text{Cost savings} &= (4267.41 \times 68\%) \times 1.5 + (4267.41 \times 32\%) \times 0.5 \\ &= \mathbf{5035.55 \text{ JDs}} \end{aligned}$$

The above cost savings is based on installation of WSDs in all buildings where appropriate. It assumes that WSDs will remain in place and will be properly maintained. Obviously, if WSDs are removed due to vandalism, theft or poor management, the savings will disappear. Hence WEPIA recommends that JTV embark on an employee education program at the same time as installation takes place. It does not include the cost savings to be obtained from water reductions in landscaping, calculated elsewhere in this document. All estimates are deliberately calculated at a conservative rate but the real cost savings may be much higher.

### **Cost Analysis**

Because the TV and radio stations are public buildings, maintenance people claim that even the screens on the faucets are being stolen. The WEPIA team verified that no screens were in place on faucets. WEPIA recommends vandal-proof WSDs as a consequence. While they are more expensive, they are preferable for public buildings. Both regular and vandal-proof aerators cost are below for the convenience of JTV administrative staff.

The table below shows the WSDs recommended for this specific site. Average prices in local market have been used.

*Table 5- list of prices for WSD*

<b>Water Saving Device</b>	<b>Price (JOD)</b>	<b>Installation fixture</b>
Domed aerator	3.00	Faucets – Bathroom
Shower aerator	3.50	Showers
Shower aerator	3.00	Faucets – Bathroom
Vandal proof domed aerator	4.00	Faucets – Bathroom

Either the regular domed aerator or the vandal proof domed aerator can be used on any threaded faucet in the buildings. For non-threaded faucets a shower aerator will do the job. Below are the numbers of fixtures in each site that need to be retrofitted.

*Table 6 – Number of sanitary fixtures to be retrofitted*

<b>Site</b>	<b>No. Of T*– Faucets</b>	<b>No. Of N ** Faucets</b>	<b>No. Of showers</b>
Radio and TV Station	75	55	25
Guard Campus	14	51	21

\* Threaded    \*\* Non –threaded

Cost of installing WSDs with vandal-proof aerators is:

$$\begin{aligned}\text{Cost} &= \text{No. Of T-faucets} * \text{Cost} + \text{No. Of N-faucets} * \text{cost} + \text{No. of showers} * \text{cost} \\ &= 89 * 4 \text{ JDs} + 106 * 3.5 \text{ JDs} + 46 * 3.5 \text{ JDs} \\ &= \mathbf{888 \text{ JDs}}\end{aligned}$$

Cost of installing WSD with ordinary domed aerators is:

$$\begin{aligned}\text{Cost} &= 89 * 3 \text{ JDs} + 106 * 3.5 \text{ JDs} + 46 * 3.5 \text{ JDs} \\ &= \mathbf{799 \text{ JDs}}\end{aligned}$$

For gravity tanks for toilets, the flushing system can be adjusted for less than **100 JDs**.

The pay back period for these water saving devices will be less than one month, all else being equal, and if WSDs continue to function properly.

#### **e. RECOMMENDATIONS**

For more efficient water use and more savings as well WEPIA recommends the following:

- To install vandal proof domed aerator to give 6 liter per minute flow rate or less on all the faucets, except for the garden.
- Adjust the trim in western toilets to supply only 6 liters in the tank.
- Install shower aerators (not new shower heads) for both the showers and the non-threaded faucets.
- Develop a water reuse system for the car wash. Cars should be washed a maximum of twice a week, rather than every day.
- Initiate an awareness program for the staff on how to conserve water.
- Develop a schedule for regular maintenance for all sanitary fixtures. Train all maintenance staff on how to maintain WSD's and fix leaks.

# Appendix

Cost Estimate of Water Consumption Reduction Efforts in Landscaping  
at  
Jordan Television Premises.

**proposal prepared for**  
**Water Efficiency and Public Information for Action (WEPIA).**

**By**

**Subhi Fahmawi-Consultant**  
**Landscape Architect, ASLA**

**February 14, 2001**

### **Background:**

At the request of JTV WEPIA provided a team to review the cost in water and currency of maintaining the gardens at JTV. The gardens, while beautiful, are a major reason for the exorbitantly high water bills of JTV. Mr. Nart Boutan requested a water audit from WEPIA to ascertain whether reductions in their expenses could be made both by installing WSDs in the buildings and applying xeriscape (desert landscape) principles to the gardens.

A team composed of Eng. Raed Nimri (WEPIA), Subhi Fahmawi (Fahmawi Landscapes) met with

Mr. Mohammed Naser, manager and financial director of JTV and Mr. Sufian Alnabils , Chief of Engineering Department, JTV met, discussed the current expenditures on the garden including water use and labor required to maintain the gardens. JTV pointed out that the number of laborers had already been slashed from 30 to 6, in an effort at cost-reduction.

A walk through the gardens and discussions with the laborers and others responsible for the gardens produced the following findings.

### **Findings:.**

The planted areas or the soft landscape of JTV is approximately 23000 square meters. Of this area approximately 10,000 square meters is under grass lawn and the rest is a mix of shrubs and trees. The gardens are watered by the gardeners every morning with a hose, and consume between 8,500 and 10,500 cubic meters of water per year. It is difficult to make accurate estimates unless a time study was done. In this case estimates of required water consumption per plant and for the kind of grass and soil available on-site was done by Mr. Fahmawi to enable him to arrive at this figure. It is a reasonable figure for the amount of landscape under planting.

The plants in the garden consist of the following:

Trees:	Cypress
	Poplar
	Cedar
	Lagerstromea
	Thuya
	Washingtonia Palm
	Phoenix Palm
	Chamaeropsis Palm
Shrubs and Hedges:	Lugestrum
	Rosemary
	Evonymus
	Nerium oleander
	Juniperus chinensis
	Hibiscus syriacos
Ground Cover:	Roses
	Mesembreauthemum,
	Ice plant



Grass Turf: 10,000sq. Meters

Assorted other plants and weeds.

### **Condition of the Gardens:**

Much of the work performed by the gardeners is related to watering. Gardeners use manual hoses for grass and all plantings, a method that is labor intensive and inefficient and not recommended for this region of the world with its endemic water shortages. Use of a manual hose also means that the grass and plants are not evenly watered. Some parts of the lawn are healthier than others, some parts have yellowed and even died. The uneven watering contributes to disease and attracts insects that further deteriorate plants.

The use of pop-up sprinklers would substantially improve the look of the lawns and, could be considered cost-savings over manual watering except that the area to be watered is so large that even more efficient methods would not provide much savings. To do the job properly, even with pop-up sprinklers would consume approximately 10,500 cubic meters of water.

### **Recommendations**

#### Plantings:

- Reduce the total area under grass from 10,000 to 2,000 sq.meters
- Put another 2000 sq. meters under decorative gravel
- Put 2000 square meters under drought-resistant ground cover (Mesemprianthemum, Portulaca, African Daisies, ice plants etc..)
- Put 2000 sq. meters under walkways and paths
- Small areas under annual flowers and shrubs, for further decorative effect.
- Retain trees and shrubs and add a few shrubs that are acclimated to the climate in Jordan such as tall grasses and lavender.

#### Technology:

- Install pop-up sprinklers for grassy areas
- Install drip-irrigation systems for trees, shrubs and ground cover

#### Improved gardening methods:

- Prune shrubs at the top rather than the bottom. This allows the lower shoots to provide shade and retain water for ground cover. Present practice is for gardeners to prune oleanders and other shrubs from the bottom.
- The addition of ground cover is important for mulching purposes and keeps the soil moist, besides providing a decorative element. The ground cover recommended above uses less than half the water of grass.
- Gravel can also be used as mulch around trees and shrubs and on topsoil. It too can be decorative.
- Grass seed should be of the low water consumption variety and drought-resistant. These include the tall fescues and rye

### **Water Consumption of Recommended Changes:**

Assuming 210 days of watering would be required in one year, the following are the consumption levels:

- 2000 sq. meters of lawn under fescue or rye grass -- 1680 cubic meters
- 1800 cubic meters for other existing trees, shrubs and plant
- 1440 m3 water for new shrubs and ground cover

TOTAL WATER CONSUMPTION = 4,920 cubic meters

### **Additional Cost Savings for Consideration by JTV:**

Using the drip and pop-up systems reduces labor needs in the gardens from 6 to 3 persons. Principal duties of the three should then be to do regular maintenance including pruning, mowing the lawn, pruning hedges, removing dead leaves and branches and weeding. Occasional spraying with pesticides can be beneficial but should be closely monitored. Certain plants such as the marigold family can obviate the need for pesticides and should be considered in the annual flower mix.

The savings on the salaries of three redundant gardeners amounts to 7,500JD/year

### **Cost:**

Plantings:

- 208 Yucca Guatemala. 3 JD each
- 98 Nerium oleanders. 2 JD each
- 150 Pittosporum tobira. 3 JD each
- 180 Evonymus japonica 3 JD each
- 5000 annual s to give color and provide additional ground cover 0.1 JD each

Total cost of Planting =  $(208 \times 3) + (98 \times 2) + (150 \times 3) + (180 \times 3) + (5000 \times 0.1)$

= 1810 JD

Technology:

- Drip Irrigation Systems: = 4,000 JD
- Pop-up sprinkler system for 2000 sq. meters = 3200 JD
- Planting = 1810 JD

**TOTAL COST: 9010 JD**